

THE RADULA OF THE EXTINCT FRESHWATER SNAIL
AYLACOSTOMA STIGMATICUM (CAENOGASTROPODA: THIARIDAE)
FROM ARGENTINA AND PARAGUAY

Roberto E. Vogler

*División Zoología Invertebrados, Facultad de Ciencias Naturales y Museo,
Universidad Nacional de La Plata, Paseo del Bosque s/n (B1900FWA), La Plata, Argentina;
Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET);
robertovogler@fcnym.unlp.edu.ar*

INTRODUCTION

Aylacostoma stigmaticum is a little known endemic freshwater snail described by Hylton Scott (1954) from specimens collected in Isla Ibicuy, an island in the High Paraná River (27°16'–27°19'S, 56°04'–56°14'W) at the border area between Argentina and Paraguay. However, at present, the Isla Ibicuy, as well as many others islands of this Paraná area (Neiff, 1986), have disappeared due to damming and the filling up of the Yacyretá Reservoir in the early 1990s (Quintana & Mercado Lackzó, 1997; Meichtry de Zaburlín et al., 2010). Because of flooding, the three endemic *Aylacostoma* species occurring in the High Paraná River [i.e., *A. guaraniticum* (Hylton Scott, 1953), *A. chloroticum* Hylton Scott, 1954, and *A. stigmaticum*], which are strictly confined to rapids, have been threatened with extinction (Quintana & Mercado Lackzó, 1997; Vogler, 2012). *Aylacostoma stigmaticum* is listed by IUCN as “Extinct in the Wild” (Mansur, 2000); but could presently be categorized as extinct, as no specimen of this species has been reported to have survived in nature or captivity. It is important to mention that an ongoing *ex situ* conservation program was developed in the 1990s. This program known, as the “*Aylacostoma* Project”, is being conducted by the National University of Misiones (UNaM, Argentina) jointly with the Argentine Museum of Natural Sciences (MACN), and is supported by the Entidad Binacional Yacyretá (EBY, Argentina-Paraguay). Currently, only *A. chloroticum* and a recently recorded new morphotype are included in this program.

The taxonomic description of *A. stigmaticum* was based solely on conchological features (according to typological approaches of most of the mid-20th century authors), especially: a conical to ovate shell, yellow horn color, low spire, last whorl somewhat convex; surface almost smooth, last whorl sculptured by low spiral

cords, a spiral band of reddish spots, and presence of irregular black spots on the surface of all specimens. The latter was stated to be the most conspicuous characteristic (Hylton Scott, 1954; Fig. 1). However, the anatomy of *A. stigmaticum* was not described and only dry shells are presently available from museum collections.

In this note, the radula of the extinct snail *A. stigmaticum* is described for the first time as a contribution to future comparative studies of *Aylacostoma*, a neotropical genus which has not been comprehensively revised yet.

MATERIALS AND METHODS

The radula was obtained from a dry syntype of *A. stigmaticum* deposited in the La Plata Museum (MLP 10965) following a modification of the method described by Holznagel (1998). The shell was rinsed with deionized water and placed in a 10 ml tube, 1.5 ml of NET buffer (10 mM Tris, 10 mM EDTA, 2% SDS) and 10 µl of proteinase K (20 mg/ml; Finnzymes #F202) were added. Solution was incubated at 37°C for seven days, adding an equal volume of proteinase K on the third day. After incubation, a gelatinous mass containing the radula was recovered from inside the shell. This tissue was incubated at 56°C with 500 µl of NET buffer and 10 µl of proteinase K for 24 hs. The cleaned radula was recovered from this incubation solution, and rinsed for four times with deionized water, mounted, and photographed using a scanning electronic microscopy (SEM). The terminology used follows Simone (2001) and Gomez et al. (2011). The radular formula is described as in Gomez et al. (2011): rachidian (number of left side cusps/median cusp/number of right side cusps); lateral teeth (inner cusps/pronounced cusp/outer cusps); marginal teeth (number of cusps on inner marginal tooth, and number of cusps on outer marginal tooth).



FIG. 1. Syntype of *A. stigmaticum* Hylton Scott, 1954 (MLP 10965).

RESULTS

The radula of *A. stigmaticum* is taenioglossate, short, forms an “S”, comprises about 75 rows of teeth (Fig. 2). Rachidian teeth pentagonal, broader than longer, with a v-shaped base; most rachidians bear seven pointed apical cusps (3/1/3), the central cusp being noticeably longer, lanceolate (Figs. 3, 4); in some rows of teeth the number of cusps varied from six to eight (formulas 3/1/2, 3/1/4; Fig. 5); rachidians with two basal cusps at each outer corner (Fig. 6). Lateral teeth long, in general with six to seven pointed cusps, the second one being larger, broad, rectangular, with asymmetrically lobate margin (1/1/4–5; Figs. 3–5); teeth of some rows with cusps showing different levels of fusion, occasionally developing bifid points. Marginal teeth similar to one another, long, spatulate, with slender, fringe-like cusps. Inner marginal teeth with about nine cusps; outer marginals with about 12 cusps.

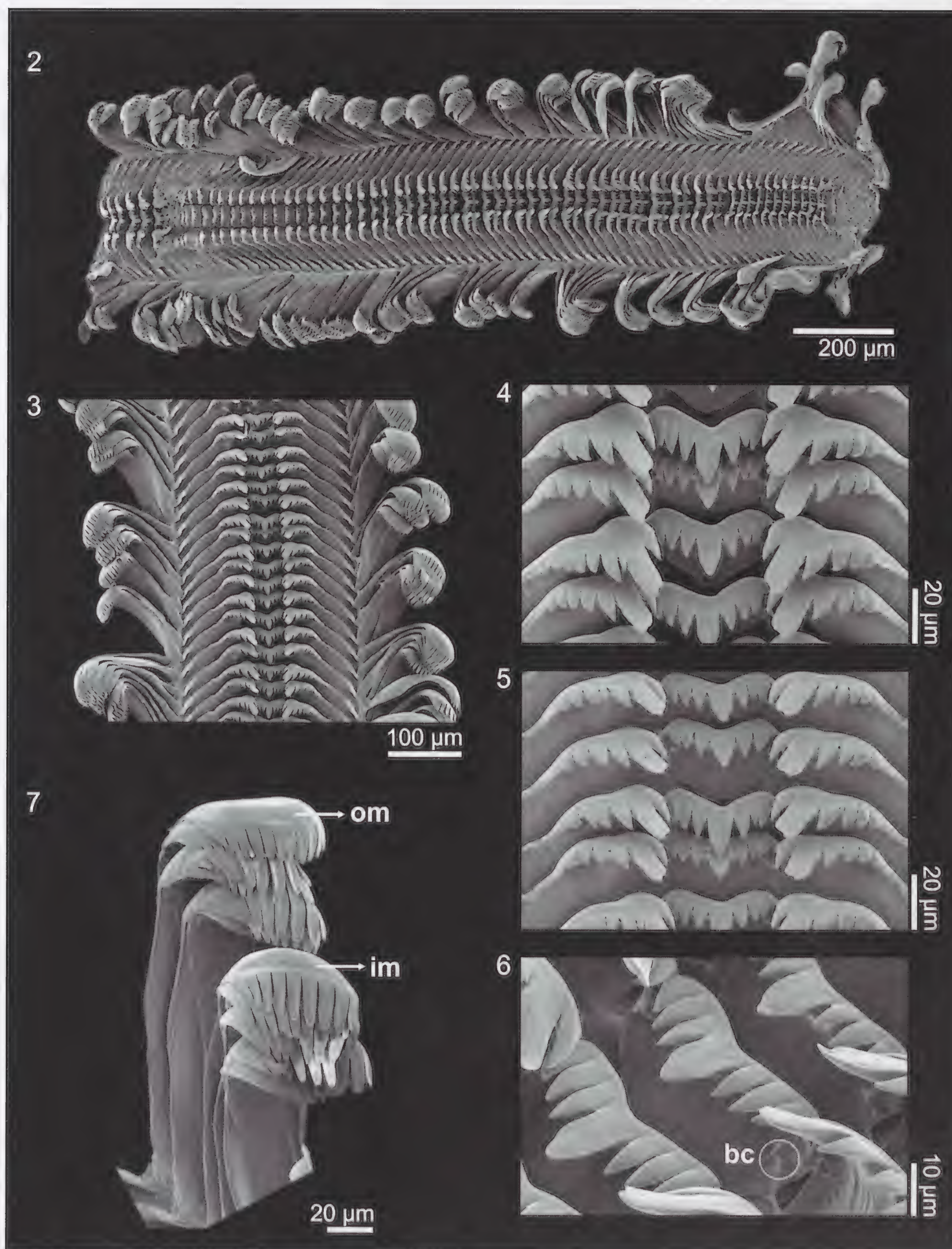
DISCUSSION

The radula of *A. stigmaticum* described here for the first time, is similar to that of other *Aylacostoma* species in having the same number

of cusps on central teeth. However, it differs from *A. guaraniticum* from Argentina-Paraguay described by Hylton Scott (1953) in having two basal cusps at each outer corner of central teeth instead of one. The central teeth of the three Brazilian species *A. exoplicata* Simone, 2001, *A. ci* Simone, 2001, and *A. tenuilabris* (Reeve, 1860) lack basal cusps altogether (Simone, 2001, 2011). The lateral teeth of *A. stigmaticum* are similar to *A. guaraniticum* and *A. ci* in having an enlarged second cusp instead of an enlarged third cusp as in *A. exoplicata* and *A. tenuilabris*. In addition, *A. stigmaticum* differs from all the mentioned species in having more denticles on both marginal teeth.

The Jamaican thiarid *Hemisinus lineolatus* (W. Wood, 1828), the only species of this genus whose anatomy has been described (Gomez et al., 2011), differs by having (1) rachidians with a central squarish cusp and a basal denticle at each outer corner, (2) lateral teeth with squarish, enlarged third cusp, and (3) marginal teeth with fewer denticles.

The radular characters described here complete the description of *A. stigmaticum* and can be used to differentiate the extinct species from other *Aylacostoma* species. This comparison suggests that the presence and number of basal cusps on rachidian teeth might be a



FIGS. 2–7. Radula of *A. stigmaticum*. FIG. 2: Radular ribbon; FIG. 3: Radular segment; FIGS. 4, 5: Detail showing central and lateral teeth; FIG. 6: Rachidian with basal cusps (bc); FIG. 7: Marginal teeth, inner marginal (im) and outer marginal (om).

useful character for differentiating species, at least among those from Argentina-Paraguay and Brazil, although this has to be confirmed by more evidence from further species.

Finally, when viewing the radula of *A. stigmaticum* under SEM, the basal cusps were not visible at first sight. Therefore, it is important to highlight that different approaches must be explored for examining the radulae of *Aylacostoma* species in order to confirm the presence or absence of these basal cusps.

ACKNOWLEDGEMENTS

I wish to thank Dr. Luiz Ricardo L. Simone, Dr. Alejandra Rumi, Lic. Ariel Aníbal Beltramino and three anonymous reviewers for helpful comments on the early version of this note; Dr. Diego E. Gutiérrez Gregoric for help in radula mounting.

LITERATURE CITED

- GOMEZ, M. I., E. E. STRONG & M. GLAUBRECHT, 2011, Redescription and anatomy of the viviparous freshwater gastropod *Hemisinus lineolatus* (W. Wood, 1828) from Jamaica (Cerithioidea, Thiaridae). *Malacologia*, 53(2): 229–250.
- HOLZNAGEL, W. E., 1998, A nondestructive method for cleaning gastropod radulae from frozen, alcohol-fixed, or dried material. *American Malacological Bulletin*, 14(2): 181–183.
- HYLTON SCOTT, M. I., 1953, El género *Hemisinus* (Melaniidae) en la costa fluvial argentina (Mol. Prosobr.). *Physis*, 20(59): 438–443.
- HYLTON SCOTT, M. I., 1954, Dos nuevos melánidos del Alto Paraná (Mol. Prosobr.). *Neotropica*, 1(3): 45–48.
- MANSUR, M. C. D., 2000, *Aylacostoma stigmaticum*. In: *IUCN 2012. IUCN Red List of Threatened Species*. Version 2012.2. Available at: <http://www.iucnredlist.org> (December 2012).
- MEICHTRY DE ZABURLÍN, N., J. G. PESO, G. G. GARRIDO & R. E. VOGLER, 2010, Sucesión espacio-temporal del plancton y bentos en periodos posteriores al llenado del Embalse Yacyretá (Río Paraná, Argentina-Paraguay). *Interciencia*, 35(12): 897–904.
- NEIFF, J. J., 1986, Las grandes unidades de vegetación y ambiente insular del río Paraná en el tramo Candelaria-Itá Ibaté. *Revista de la Asociación de Ciencias Naturales del Litoral*, 17(1): 7–30.
- QUINTANA, M. G. & A. C. MERCADO LACZKÓ, 1997, Caracoles de los rápidos en Yacyretá. *Ciencia Hoy*, 7(41): 22–31.
- REEVE, L. A., 1860, Monograph of the genus *Hemisinus*. *Conchologia Iconica*, 12: 6 pls.
- SIMONE, L. R. L., 2001, Phylogenetic analyses of Cerithioidea (Mollusca, Caenogastropoda) based on comparative morphology. *Arquivos de Zoologia*, 36(2): 147–263.
- SIMONE, L. R. L., 2011, Phylogeny of the Caenogastropoda (Mollusca), based on comparative morphology. *Arquivos de Zoologia*, 42(4): 161–323.
- VOGLER, R. E., 2012, *Aylacostoma chloroticum* Hylton Scott, 1954: antecedentes de la especie. *Amici Molluscarum*, 20(1): 43–46.
- WOOD, W., 1828, *Supplement to the Index testaceologicus; or a catalogue of shells, British and foreign*. Wood, London, vi + 59 pp., 8 pls.

Revised ms. accepted February 4, 2013